Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(5): 742-744

Received: 28-07-2019
Accepted: 30-08-2019

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Certain serum trace minerals in Pandharpuri buffaloes

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Abstract
The study was conducted to observe the impact of lactation on serum trace minerals in Pandharpuri buffaloes maintained at college farm of KNP College of Veterinary Science, Shirwal. The animals were categorized in Group 1(Lactating) and Group 2 (Non-lactating) comprising 8 (eight) animals in each group. Trace minerals (Fe, Cu and Zn) were analyzed by using AAS. The present data reveals that there was significant effect of lactation on the levels of serum zinc with lower value in lactating than non-lactating Pandharpuri buffaloes. However, there was no significant effect of lactation on the levels of serum iron and copper values in these groups. The value of iron was non significantly higher and the value of copper was non significantly lower in nonlactating than lactating Pandharpuri buffaloes. All trace minerals studied in blood serum of lactating and non-lactating Pandharpuri buffaloes were within physiological limits.

Keywords: Serum, trace minerals, lactating, Pandharpuri, buffaloes

1. Introduction
The buffalo milk is having high consumer demand due to its high fat percentage. About 57% of total buffalo (*Bubalus bubalis*) population of the whole world is in India. Some breeds of buffaloes in Maharashtra like Pandharpuri, Nagpuri, Marathwadi, etc. are highly popular in their own regions, because they are having good ability to produce milk with low quality fodder. The Pandharpuri buffaloe has lactation length of 350 days with 1500 kg milk production [1].

Under nutrition is a major cause for low performance. Marked responses in growth and reproduction have been obtained from mineral and vitamin supplements. Minerals are solid crystalline substances which cannot be synthesized in the body [2]. Multiple trace minerals are essential for basic physiological functions. An organism needs optimum concentrations of both macro and micro-elements to maintain its life (Khan, *et al*. 2009) [3].

In general, trace elements like copper (Cu), iron (Fe), Zinc (Zn) and others are needed, being integral part of metal-enzymes, for vitamin synthesis, hormone production, enzyme activity, collagen formation, tissue synthesis, oxygen transport, energy production and other physiological processes related to growth, reproduction and health.

Minerals are important constituents of the animal nutrition. They play decisive role in overall metabolism, normal growth, production and reproduction. Imbalance of some minerals may have deleterious effect on health. Minerals supplementation improves reproductive performance because of their positive effect on steroid synthesis, release, follicular growth and symptoms of ovulatory oestrus (Srivastava, 2008) [4].

In general, trace elements like copper (Cu), iron (Fe), Zinc (Zn) and others are needed, being integral part of metal-enzymes, for different metabolic processes in the body [5]. Animal studies have indicated that all phases of reproduction in the female, from oestrus to parturition and lactation, are affected adversely by zinc deficiency (Patodkar *et al*. 2018) [6]. No data is available for serum trace minerals in Pandharpuri buffaloes. There is a scanty information about the trace minerals status in the blood of buffalo associated with lactation. Hence, present study was undertaken to have the baseline data of iron, copper and zinc in lactating and non-lactating Pandharpuri buffaloes.

2. Materials and Methods
The present investigation was carried out in the Department of Veterinary Physiology, KNP College of Veterinary Science, Shirwal, Maharashtra Animal and Fishery Sciences University,

Nagpur. The present investigation was carried out in the Department of Veterinary Physiology, KNP College of Veterinary Science, Shirwal, Maharashtra Animal and Fishery Sciences University, Nagpur. Sixteen Pandharpuri buffaloes of college farm were categorized into Lactating and Non-lactating groups each containing 8 animals. Serum samples from experimental animals were analyzed for certain trace minerals viz., Fe, Cu and Zn by Atomic Absorption Spectrophotometer (AAS, ELICO, Ltd, Model SL-194). The samples were digested as per Kolmer *et al.* (1951) [7]

2.1 Digestion procedure of serum samples

One ml serum sample was taken in 25 ml volumetric flask, to which 5 ml of di-acid mixture was added. The di-acid mixture contained 70% perchloric acid (one part) and concentrated nitric acid (four parts). The contents of volumetric flask were boiled gently for 30-45 minutes to oxidize all the easily oxidizable material. The solution was boiled until it became nearly colorless. The precaution was taken while heating the solution not allowing it to go to dryness. The solution was cooled to which some distilled water was added. The solution was then diluted to 25 ml with deionized water. The prepared aliquot was used for the analysis of the minerals under study [8].

3. Results and Discussion

The Mean ± SE values of Serum (ppm) Iron, Copper and Zinc in Lactating and non-lactating groups of Pandharpuri Buffaloes are given in Table 1.

3.1 Serum Iron (Fe): The average value in non-lactating Pandharpuri Buffaloes was comparable to the findings reported by Fatima *et al.* (2014) [9]. The average value in lactating buffaloes was comparable to the findings reported by Fatima *et al.* and Patodkar 2014 in buffaloes [8, 9]. However, values reported in cattle were higher than the present findings [10]. However, values reported in buffaloes were lower than the present findings [9].

Statistical analysis of present data revealed that there was no significant difference in the values of serum iron (ppm) between the two groups of Pandharpuri buffaloes. The present findings of lower values of serum iron in lactating as compared to non-lactating Pandharpuri buffaloes was in agreement with the findings of report much higher values in non-lactating compared to lactating buffaloes [9].

Higher values of serum iron in non-lactating than in lactating buffaloes in present study might be due to expected higher concentration of haemoglobin in non-lactating buffaloes. Higher values of haemoglobin in non-lactating animals as compared to lactating animals were recorded by Fatima *et al.* (2014) [9]. Secondly, since there is huge secretion of iron in the milk, the values of serum iron in lactating animals might be low as compared to non-lactating animals.

3.2 Serum Copper (ppm): The average values in lactating Pandharpuri Buffaloes was comparable to the findings reported in cattle. However, values reported by Patodkar in lactating buffaloes and in cattle were lower than the present findings [8, 10]. Statistical analysis of present data reveals that there was no significant difference in the values of serum copper between the two groups of Pandharpuri buffaloes. It has been reported from their month wise observation of copper level that after parturition the whole blood and blood plasma concentration of copper reflected the increasing trend with advancement of lactation in buffaloes and cows [11]. It has been recorded similar increasing month wise pattern in the values of plasma copper throughout lactation [12]. However, decreasing trend of plasma copper in freshly calved cows at peak out lactation has been also observed [13].

Since, most of the selected non-lactating animals are prepubertal heifers and lactating animals are mostly cyclic in present study, the possible cause for higher values of serum copper in lactating Pandharpuri buffaloes was associated with level of estrogens. Estrogens have been reported to increase the level of copper (Sato and Henkins, 1973) [14].

3.3 Serum Zinc (ppm): The average value of serum Zinc (ppm) in lactating Pandharpuri Buffaloes was comparable with in cattle

Statistical analysis of present data reveals that there was a significant difference at 1% level of significance in the values of serum Zinc (ppm) between the two groups of Pandharpuri buffaloes.

It has been reported that the mean concentration of zinc was significantly low in lactating as compared to young growing calves, cycling and pregnant heifers and opined that this variation in the levels of zinc is indicative of their nutrient outgo in milk [13]. Moreover the same reasoning is also applicable for the present findings where the values of serum zinc were significantly lower in lactating as compared to non-lactating pandharpuri buffaloes. On similar line Patodkar (2014) detected the levels of zinc in blood and milk who reported a decreasing trend in the level of zinc in blood with a corresponding increase in its level in milk, he also opined that reduced level of zinc in blood during lactation could be due to drain of zinc in milk during lactation [8].

Table 1: Mean ± SE of Serum Iron, Copper and Zinc and their range in Lactating and non-lactating groups of Pandharpuri Buffaloes

Sr. No.	Groups	Mean ± SE (ppm)		
		Iron	Copper	Zinc
1	Lactating Buffaloes	1.58 ^{a} ± 0.25	2.71 ^{a} ± 0.48	1.01^{a} ± 0.20
2	Non-lactating Buffaloes	2.17 ^{a} ± 0.33	2.37 ^{a} ± 0.62	2.02 ^{b} ± 0.32
	Average	1.87 ± 0.21	2.54 ± 0.38	1.51 ± 0.22

(In columns of Mean± SE of Iron, copper and zinc, similar superscripts indicates no significant difference and dissimilar superscripts indicates significant difference at 1% level)

4. Conclusion

It could be concluded that the values of serum zinc (Zn) showed significantly lower levels in lactating as compared to non-lactating Pandharpuri buffaloes which may be associated with nutrient outgo in milk. The value of iron was non significantly higher and the value of copper was non significantly lower in non lactating than lactating Pandharpuri buffaloes. All trace minerals studied in blood serum of lactating and non-lactating Pandharpuri buffaloes were within physiological limits.

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